1. A processing system having a vacuum environment therein and comprising:

a processing module having mounting structure therein configured to removably mount a maintenance item in the vacuum environment in the processing module and to present the maintenance item for pick up by a wafer transfer mechanism;

the processing module having a maintenance item removably mounted on the mounting structure;

a transfer system having a transfer mechanism therein configured to transfer a maintenance item within the vacuum environment between the mounting structure in the processing module and the transfer system without exposing the processing module to an outside environment.

2. The processing system as claimed in claim 1, further comprising:

an isolation assembly coupled between the processing module and the transfer system, the isolation assembly comprising a gate valve assembly.

3. The processing system as claimed in claim 1, further comprising:

a maintenance system comprising a storage assembly storing at least one maintenance item and an exchange system for transferring a maintenance item between the transfer system and the maintenance system without exposing the vacuum environment to an outside environment.

4. The processing system as claimed in claim 3, further comprising:

an isolation assembly coupled between the maintenance system and the transfer system, the isolation assembly comprising a gate valve assembly.

5. The processing system as claimed in claim 3, wherein the exchange system comprises a drive system, a transfer arm coupled to the drive system, and an end effector coupled to the transfer arm, the drive system being used to move the transfer arm and the end effector in at least one direction in order to transfer the removably mounted maintenance item between the maintenance system and the processing module.

6. The processing system as claimed in claim 3, wherein the exchange system comprises a drive system, a transfer arm coupled to the drive system, and an end effector coupled to the transfer arm, the drive system being used to move the transfer

arm and the end effector to transfer the substrate between a transfer plate in the transfer system and a substrate holder in the processing module.

7. The processing system as claimed in claim 3, wherein the exchange system comprises a drive system, a transfer arm coupled to the drive system, and an end effector coupled to the transfer arm, the drive system being used to move the transfer arm and the end effector to transfer the removably mounted maintenance item between the transfer system and a storage assembly in the maintenance system.

8. The processing system as claimed in claim 1, wherein the transfer system comprises a transfer plate and a transfer assembly for moving the transfer plate from the one position to another position.

9. The processing system as claimed in claim 1, wherein the maintenance item comprises at least one of a ring, a shield, an insulator, an adapter, a baffle, and a plate.

10. The processing system as claimed in claim 1, further comprising:

a controller coupled to the processing module and the transfer system, the controller being programmed to control the processing module and the transfer system to replace the maintenance item on the mounting structure without exposing the processing module to an outside environment.

11. The processing system of claim 1 wherein:

the processing module is an etching module having an upwardly facing wafer support in a vacuum environment therein;

the maintenance item is an annular member in a mounting position in the etching module surrounding a wafer support area of the wafer support where the maintenance item is prone to being etched by an etching process being performed on a wafer in the etching module; and

the maintenance item is mounted in its mounting position in the etching module so as to be removable from the processing module in part by a lifting of the maintenance item from the mounting position.

12. The processing system of claim 1 wherein:

the processing module includes a deposition module having an upwardly facing wafer support in a vacuum environment therein;

the maintenance item is an annular member in a mounting position in the deposition module surrounding a wafer support area of the wafer support where the maintenance item is prone to collecting deposits of material thereon when a deposition process is performed on a wafer on the support in the deposition module; and

the maintenance item is mounted in its mounting position in the deposition module so as to be removable from the processing module in part by a lifting of the maintenance item from the mounting position.

13. The processing system of claim 1 wherein:

the mounting structure is configured to move the maintenance item into position for pick up by the transfer mechanism.

14. The processing system of claim 13 wherein:

the maintenance item is an annular ring configured to surround a wafer on a wafer support;

the mounting structure includes a set of lift pins operable to lift the ring into position for pick up by a wafer transfer arm.

15. The processing system of claim 13 wherein:

the maintenance item is supported within the processing module from the top of the processing module;

the mounting structure includes a set of elements for releaseably holding the maintenance item and operable to lower the maintenance item into position for pick up by a wafer transfer arm.

16. The processing system of claim 13 wherein:

the transfer mechanism includes a wafer transfer arm and a separate transfer arm configured to pick up a maintenance item.

17. The processing system as claimed in claim 1, wherein the processing module comprises at least one of an ALD module, a deposition module, a coating

module, a patterning module, a developing module, a metrology module, a thermal processing module, and a cleaning module.

18. A method of operating a processing system, the method comprising:

coupling a processing module to a transfer system having a wafer transfer arm therein, the processing module having a first maintenance item removably mounted therein;

presenting the first maintenance item within the processing module for pick up by a transfer arm of the transfer system; and

picking up the maintenance item with the wafer transfer arm and transferring the first maintenance item from the processing module to the transfer system without exposing the processing module to an outside environment.

19. The method of claim 18 wherein:

the maintenance item is an annular member in a mounting position in the processing module that surrounds a wafer support area on an upwardly facing wafer support where the maintenance item is prone to being etched or coated by a process performed on the wafer in the processing module; and

the maintenance item is removable from the processing module in part by lifting the maintenance item from the mounting position.

20. The method of operating a processing system as claimed in claim 18, the method further comprising:

coupling a maintenance system to the transfer system, the maintenance system having a second maintenance item therein;

transferring the second maintenance item from the maintenance system to the transfer system;

transferring the second maintenance item from the transfer system to the processing module without exposing the processing module to an outside environment; and

removably mounting the second maintenance to the module.

21. The method of operating a processing system as claimed in claim 18, the method further comprising:

transferring the first maintenance item to a transfer plate; and

moving the transfer plate from a first position to a second position.

22. The method of operating a processing system as claimed in claim 18, the method further comprising:

transferring the second maintenance item to a transfer plate; and

moving the transfer plate from a second position to a first position.

23. The method of operating a processing system as claimed in claim 18, the method further comprising:

transferring the first maintenance item to a storage assembly in a maintenance system without exposing the processing module to an outside environment.

24. The method of operating a processing system as claimed in claim 20, the method further comprising:

transferring a substrate from the transfer system to the processing module without exposing the processing module to an outside environment;

processing the substrate in the processing module; and

transferring the processed substrate from the processing module to the transfer system.

25. The method of operating a processing system as claimed in claim 18, the method further comprising:

monitoring the first maintenance item without exposing the processing module to an outside environment;

determining when to replace the first etching maintenance item; and

performing the detaching and the transferring in response to the determination.

26. The method of operating a processing system as claimed in claim 18, the method further comprising:

monitoring a processing recipe for the processing module; and

determining when to exchange the first maintenance item with a second maintenance item, wherein the process recipe specifies a different maintenance item.

27. The method of claim 18 further comprising:

coupling a processing module having a first maintenance item removably mounted therein to a first exchange system;

coupling the first exchange system to a transfer system;

detaching the first maintenance item from the processing module; and

transferring the first maintenance item from the processing module to the transfer system without exposing the processing module to an outside environment.

28. The method of operating a processing system as claimed in claim 27, the method further comprising:

coupling a maintenance system to a second exchange system, the maintenance system comprising a second etching maintenance item, wherein the second etching maintenance item can be removably mounted in the etching module;

coupling the second exchange system to a second position in the transfer system;

transferring the second etching maintenance item from the maintenance system to the transfer system, wherein the second exchange system comprises means for transferring the maintenance item between the maintenance system and the transfer system without exposing the etching module to an outside environment;

transferring the second etching maintenance item from the transfer system to the processing module, wherein the first exchange system comprises means for transferring the second etching maintenance item between the transfer system and the processing module without exposing the etching module to an outside environment; and

removably coupling the second etching maintenance item to the etching module.

29. A method of operating a processing system comprising:

coupling a processing module having a first maintenance item removably mounted therein to an exchange system using a first isolation assembly;

coupling the exchange system to a maintenance system using a second isolation assembly;

vertically moving the maintenance item into position within the processing module for pick up of the first maintenance item from the processing module by the wafer transfer arm;

transferring the first maintenance item from the processing module to the maintenance system through the first and second isolation assemblies without exposing the processing module and the first maintenance item to an outside environment;

transferring a second maintenance item from the maintenance system to the processing module through the first and second isolation assemblies without exposing the processing module and the second maintenance item to an outside environment; and

removably mounting the second maintenance item to the processing module.